Dual-Rate 1000BASE-SX and 10GBASE-SR SFP+ 850nm 300m Optical Transceiver

Features

- Hot pluggable SFP+ footprint

- Supports 9.95 to 10.5 Gb/s bit rates

- Power dissipation＜1W

- RoHS-6 compliant (lead free)

- Commercial temperature range 0°C to 70°C

- Single +3.3V Power Supply

- Maximum link length of 400m on OM4 MMF

- Uncooled 850nm VCSEL laser

- Receiver limiting electrical interface

- Duplex LC connector

- Built in digital diagnostic functions

Applications

- 1000BASE SX 1G Ethernet

- 10GBASE SR/SW 10G Ethernet

Compliance

- SFF-8431

- IEEE 802.3-2012 10G-SR/SW

- 1000BASE-SX

Description

The SFP-1/10G-SR transceivers are designed for use in 1-Gigabit and 10-Gigabit Ethernet links over multi mode fiber. They are compliant with SFF-8431, IEEE 802.3-2012 10G-SR/SW and 1000BASE-SX.

Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. The FTLX8574D3BCV is a "limiting module", i.e., it employs a limiting receiver. Host board designers using an EDC PHY IC should follow the IC manufacturer's recommended settings for interoperability with an SFP+ limiting module. This product is for applications specifically designed for 10G SFP+ ports and 1G/10G SFP+ ports and not native 1G SFP ports. The optical transceiver is compliant per the RoHS Directive 2011/65/EU.

General Specifications

Table1-General Specifications

Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Bit Rate (RS0 = LOW)	BR		1.25		Gb/s	1
Bit Rate (RS0 = HIGH)	BR	9.95	10.3		Gb/s	2

Table2-General Specifications

Parameter		Symbol	Max. Supported Distance		Units
Distance			@ 1G	@ 10G	
Fiber Type	850nm OFL Bandwidth				
62.5m	160MHz-km	Lmax	220	26	m
	OM1 200MHz-km		275	33	
50m	400MHz-km	Lmax	500	66	m
	OM2 500MHz-km		550	82	
	OM3 2000MHz-km		>550	300	
	OM4 4700MHz-km		>550	400	

Notes:

[1] 1000BASE-SX. Tested with a 27-1 PRBS. See Section I, Note 5 for RS0 conditions for 1.25Gb/s operation.

[2] 10GBASE-SR/SW. Tested with a 231 -1 PRBS. See Section I, Note 5 for RS0 conditions for 10.3Gb/s operation.

Absolute Maximum Ratings

Table3-Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Maximum Supply Voltage	Vcc	-0.5		4.0	V	
Storage Temperature	T_S	-40		85	°C	
Case Operating Temperature	T_{OP}	0		70	°C	
Relative Humidity	RH	0		85	%	1

Electrical Characteristics (TOP= 0 to 70 °C, VCC = 3.14 to 3.46 Volts)

Table4-Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Supply Voltage	V_{CC}	3.14	3.30	3.46	V	
Supply Current	I_{CC}		200	285	mA	
Transmitter						
Input differential impedance	R_{in}		100		Ω	1
Differential data input swing	$V_{in\ pp}$	180		700	mV	2
Transmit Disable Voltage	V_D	2		Vcc	V	
Transmit Enable Voltage	V_{EN}	Vee		Vee+0.8	V	
Receiver						
Differential data output swing	Vout pp	300		850	mV	3
Output rise time and fall time	$T_r\ T_f$	28			ps	4
LOS asserted	$V_{LOS\ fault}$	2		Vcc_{HOST}	V	5
LOS de-asserted	$V_{LOS\ norm}$	Vee		Vee+0.8	V	5
Power Supply Noise Tolerance	V_{ccT}/V_{ccR}		Per SFF-8431 Rev 4.1		mVpp	6

Notes:

[1] Connected directly to TX data input pins. AC coupling from pins into laser driver IC.

[2] Voltage swing for 1G operation is equivalent to voltage swing in 10G operation (SFF-8431 Rev 4.1).

[3] Into100Ωdifferential termination.

[4] 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative.

[5] LOS is an open collector output. Should be pulled up with 4.7kΩ–10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5V.

[6] Testing methodology per SFF-8431. Rev 4.1.

Optical Characteristics for RS0=HIGH (10G Operation)(TOP =0 to 70°C, VCC3 = 3.14 to 3.46 Volts)

Table5-Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note

Transmitter						
Average Launch Power	P_{AVE}	-6.5		-1	dBm	1
Optical Wavelength	λ	840	850	860	nm	2
Rise-Fall Time	Trise/Tfall			0.26	ns	3
RMS Spectral Width	$\Delta \lambda_{rms}$			0.45	dB	
Optical Extinction Ratio	ER	9			dB	
Average Launch power of OFF transmitter	P_{OFF}			-30	dBm	
Tx Jitter	Txj	Per IEEE 802.3-2012 Table 38-10				
Relative Intensity Noise	RIN_{12} OMA			-117	dB Hz	
Coupled Power Ratio	CPR	9			dB	
Receiver						
Optical Center Wavelength	λ_C	840		860	nm	2
Receiver Sensitivity	R_{SENS}			-9.9	dBm	
Stressed Receiver Sensitivity 50 μm MMF	SRS_{um}			-13.5	dBm	4
Stressed Receiver Sensitivity 62.5 μm MMF	SRS_{um}			-12.5	dBm	4
Maximum Input Power	P_{MAX}	+0.5			dBm	
Return Loss	Rrx	12			dB	
Receive electrical 3dB upper cutoff frequency			1500		MHz	2
LOS De-Assert	LOS_D			-18	dBm	
LOS Assert	LOS_A	-30	-23		dBm	
LOS Hysteresis		0.5			dB	

Notes:

[1] Max is equivalent to 10G max spec

[2] This product has not been designed to support 780-nm laser operation.

[3] 20%-80%.

[4] Per IEEE 802.3-2012. 9dB extinction ratio transmitter.

Optical Characteristics for RS0=HIGH (10G Operation)(TOP =0 to 70°C, VCC3 = 3.14 to 3.46 Volts)

Table6-Optical Characteristics						
Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Transmitter						
Optical Modulation Amplitude (OMA)	P_{OMA}		-1.5		dBm	1
Average Launch Power	P_{AVE}	-5		-1	dBm	2
Optical Wavelength	λ	840	850	860	nm	1
RMS Spectral Width	$\Delta \lambda rms$			0.45	dB	1
Optical Extinction Ratio	ER	3.0	5.5		dB	

Transmitter and Dispersion Penalty	TDP			3.9	dB	
Average Launch power of OFF transmitter	P$_{OFF}$			-30	dBm	
Tx Jitter	Txj	Per IEEE 802.3-2012 requirements				
Encircled Flux	<4.5m			30	%	3
	<19m	86			%	3
Relative Intensity Noise	RIN$_{12}$ OMA			-128		
Receiver						
Receiver Sensitivity(OMA)@ 10.3Gb/s	R$_{SENS}$			-11.1	dBm	4
Stressed Receiver Sensitivity (OMA) @10.3Gb/s	R$_{SENS}$			-7.5	dBm	5
Maximum Input Power	P$_{MAX}$	+0.5			dBm	
Wavelength Range	λ$_{C}$	840		860	nm	
Receiver Reflectance	Rrx			-12	dB	
LOS De-Assert	LOS$_{D}$			-14	dBm	
LOS Assert	LOS$_{A}$	-30			dBm	
LOS Hysteresis		0.5			dB	

Notes:

[1] Per Trade off Table 52.8, IEEE 802.3-2012

[2] Average Power figures are informative only, per IEEE802.3-2012.

[3] Measured into Type A1a (50/125 μm multi mode) fiber per ANSI/TIA/EIA-455-203-2.

[4] Measured with worst ER; BER＜10-12; 231- 1 PRBS.

[5] Per IEEE 802.3-2012.

Digital Diagnostic Specifications

Dual-Rate 1000BASE-SX and 10GBASE-SR SFP+ transceivers can be used in host systems that require either internally or externally calibrated digital diagnostics.

Table7-Digital Diagnostic Specifications						
Parameter	Symbol	Min.	Typical	Max.	Unit	Ref.
Accuracy						
Internally measured transceiver temperature	ΔDD Temperature	-3		3	ºC	
Internally measured transceiver supply voltage	ΔDD Voltage	-100		100	%	
Measured TX bias current	ΔDD Bias	-10		10	%	1
Measured TX output power	ΔDD Tx Power	-2		2	dB	
Measured RX received average optical power	ΔDD Rx Power	-2		2	dB	
Dynamic Range for Rated Accuracy						
Internally measured transceiver temperature	DD Temperature	0		70	ºC	

Internally measured transceiver supply voltage	DD Voltage	3.14		3.46	V	
Measured TX bias current	DD Bias	0		20	mA	
Measured TX output power	DD Tx Power	-9		-2.5	dBm	
Measured RX received average optical power	DD Rx Power	-20		0	dBm	
Max Reporting Range						
Internally measured transceiver temperature	DD Temperature	-40		125	ºC	
Internally measured transceiver supply voltage	DD Voltage	2.8		4.0	V	
Measured TX bias current	DD Bias	0		20	mA	
Measured TX output power	DD Tx Power	-10		-1	dBm	
Measured RX received average optical power	DD Rx Power	-22		0	dBm	

Note:

[1] Accuracy of measured Tx bias current is 10% of the actual bias current from the laser driver to the laser.
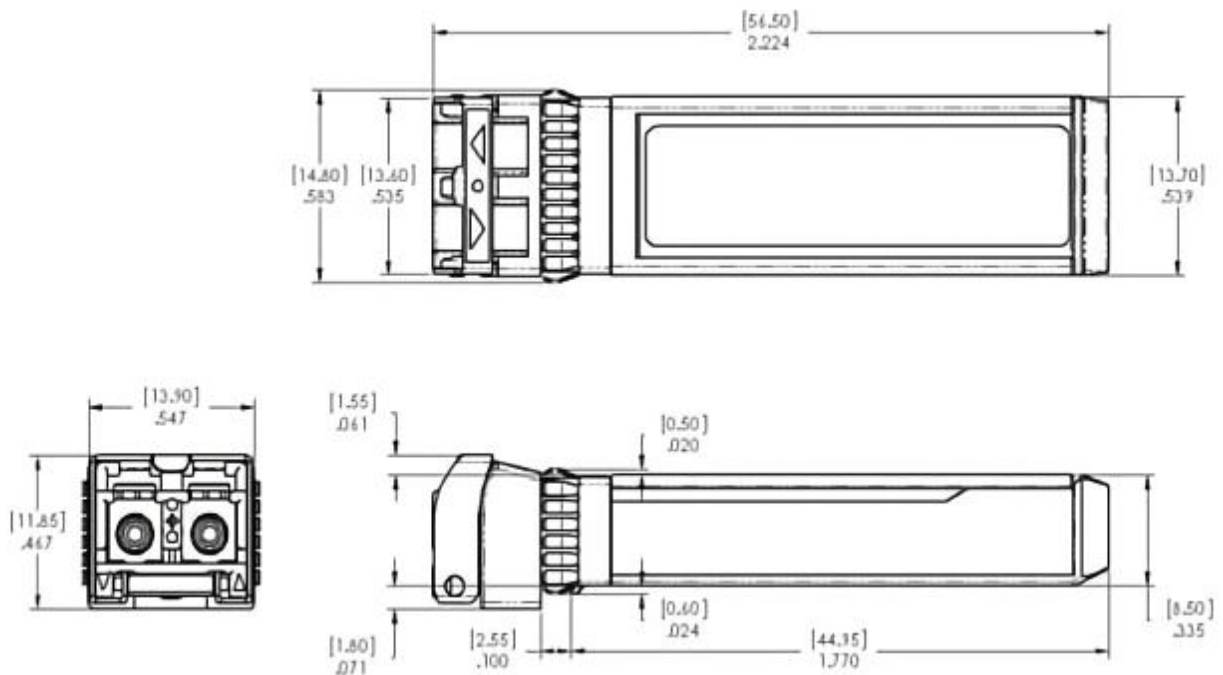
Pin Function Definitions

Table8-Pin Description			
PIN	**Symbol**	**Name/Description**	**Ref.**
1	VeeT	Transmitter Ground	1
2	TFault	Transmitter Fault	2
3	TDIS	Transmitter Disable. Laser output disabled on high or open.	3
4	SDA	2-wire Serial Interface Data Line	2
5	SCL	2-wire Serial Interface Clock Line	2
6	MOD-ABS	Module Absent. Grounded within the module	2
7	RS0	Rate Select 0.	4
8	RX-LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	RS1	Rate Select 1.	4
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Receiver Inverted DATA out. AC Coupled.	
13	RD+	Receiver Non-inverted DATA out. AC Coupled.	
14	VeeR	Receiver Ground	1
15	VccR	Receiver Power Supply	
16	VccT	Transmitter Power Supply	
17	VeeT	Transmitter Ground	1

18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VeeT	Transmitter Ground	1

Notes:

[1] Circuit ground is internally isolated from chassis ground.

[2] TFAULT is an open collector/drain output, which should be pulled up with a 4.7k -10k Ohms resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to ＜0.8V.

[3] Laser output disabled on TDIS ＞2.0V or open, enabled on TDIS ＜0.8V.

[4] Internally pulled down per SFF-8431 Rev 2.0. See Sec. X for the logic table to use for the internal CDRs locking modes.

[5] LOS is open collector output. Should be pulled up with 4.7kΩ -10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Mechanical Specifications

PCB Layout and Bezel Recommendations

NOTES:
1. MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY

2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

Further Information：

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